

REMARKS

Applicant respectfully requests reconsideration of the rejection of claims as being unpatentable under 35 U.S.C. §103(a) over U.S. Patent 5,804,035 (Michanickl) in view of WIPO publication WO 03/040462 (Akhtar et al.), further in view of JP005 or Russell '536, and with respect to claims 25, 26, and 40, further in view of Berstrom.

Applicant's claim 23 requires swelling a composite board material by subjecting it to electromagnetic radiation and soaking / immersion in a liquid medium. The composite board material is medium density fibreboard (MDF) comprising lignocellulosic fibres bonded together by adhesive. The electromagnetic radiation hydrolyses the adhesive. The treated board is mechanically agitated to separate the lignocellulosic fibres, which are then recovered.

Mickanickl discloses methods for the recovery of wood fibers from timber-derived materials by swelling the materials with an impregnating solution, heating the impregnated materials, and then separating the disintegrated materials. Nowhere does Mickanickl disclose utilizing electromagnetic radiation. The Office has cited Akhtar to compensate for this deficiency.

In applicant's prior response, he urged that the modifying the Michanickl process by incorporating the microwaving operation from Akhtar is inappropriate because Akhtar is non-analogous art. That is, the Akhtar reference is neither in applicant's field nor is it reasonably pertinent to the particular problem with which applicant was concerned, under the principles stated in MPEP 2141. He also urged that even if the reference were analogous art, one skilled in the art would not be inclined to employ Akhtar's microwaving function of breaking cell walls and membranes, which is of course desirable for their purpose of getting low-lignin contaminated wood fibers out of native wood in the context of papermaking; but is neither necessary, nor helpful, nor germane to recovery of high-lignin contaminated lignocellulosic elements from recycled board products.¹ Applicant

¹ Applicant incorporates his prior statements regarding the non-analogous nature of Akhtar and lack of reasons to make the proposed combination.

respectfully submits that one skilled in the art would have no reason to modify Michanickl with Akhtar for the further reasons presented below, especially in light of the above amendments.²

The Office asserts on page 17 that Akhtar, Michanickl, and the present process are all related in the field of recovery of fibrous material by mechanical processing. However, this ignores the fact that applicant and Michanickl were seeking to recovery in-tact lignocellulosic fibres from discarded wood products for use in wood products containing recycled in-tact lignocellulosic fibres. In contrast, Akhtar was seeking to free cellulosic fibres -- preferably with low- or no-lignin -- for use of the fibres in paper pulping. So the fibres Akhtar yields are markedly different. Applicant's and Michanickl's fibres are not suitable for paper pulping, and Akhtar's fibres are not in-tact lignocellulosic fibres achieving the full ecological benefit of applicant's fibres.

The Office asserts that since Akhtar is a mechanical process, it is directed to "breaking the lignin which holds the fibres together." The fact that Akhtar is directed to "breaking the lignin" underscores that it is fundamentally different and does not yield applicant's lignocellulosic fibres. To underscore this distinction applicant has amended his claim to specify that "said lignocellulosic fibres" are recovered, pointing directly back to the fibres in the starting material.

Moreover, Akhtar state [0003]:

Lignin, the least desirable component in the pulp, is a complex macromolecule of aromatic units with several different types of interunit linkages. In the native wood, lignin physically protects cellulose polysaccharides known as lignocellulosics that must be disrupted for there to be accessibility to the polysaccharides, (e.g., by enzymes) or to separate lignin from the matrix of the wood fibers.

Then he goes on to state in [0004] that mechanical pulping may be used, and in [0006] he describes the high energy requirements of mechanical (RMP) processing. However, the RMP process results in lower strength paper because

² With this amendment, applicant is limiting prosecution in this application to one particularly preferred embodiment, and reserves his right to pursue the broader claims covering other embodiments in a continuation application.

the intense mechanical action pulverizes the fibres. And because of this intense pulverization, much of the lignin is separated from the fibres.

So it is evident that even though some lignin is retained on the fibres after Akhtar's microwave + RMP processing, the resulting product is not "said lignocellulosic fibres," i.e., the lignocellulosic fibres from the starting material. Rather, the fibres recovered by Akhtar are severely broken and "disrupted" segments of the original fibres.

One skilled in the art reading the Akhtar reference would therefore not see it as providing a workable solution to yielding ecologically recycled lignocellulosic fibres from MDF because Akhtar's microwaving is stated to result in "breakage of pit membranes and vessel cell ends caused by steam pressure generated inside the wood" which breakage is not desirable when trying to recover lignocellulosic fibres in-tact from the feed MDF. One skilled in the art would also not see Akhtar as being workable for applicant's purpose because after microwaving, intense mechanical action of RMP is required, such that the resulting product is severed fibres, not the in-tact lignocellulosic fibres from the MDF. And if RMP is not employed, one of the other thermomechanical, biological, chemical, or enzymatic processes described by Akhtar must be used.

One skilled in the art would further not find Akhtar to be relevant or helpful in light of the amendment of claim 1 to expressly require "wherein the generated electromagnetic radiation at least partially hydrolyses the adhesive." Akhtar's starting materials contain no adhesive. And Akhtar's microwaving is stated to result in "breakage of pit membranes and vessel cell ends caused by steam pressure generated inside the wood," which is harmful or at least irrelevant to recovering in-tact lignocellulosic fibres from MDF.

Applicant has amended claim 1 to require that the starting material be medium density fibreboard. This excludes chip board. The Office acknowledges on page 18 of the Office action that the starting materials are different "except in the case of chip boards." So this amendment renders Akhtar even less relevant. To bridge this gap, the Office relies on JP005 and Russell. JP005 refers to

various materials including regenerated cellulose fibre, wood, plywood, veneer, and wood chips. None of these is medium density fibreboard.

Moreover, the microwave induction preheating in JP005 is stated to facilitate impregnation of the treating solution into the material. This does not directly correlate to the hydrolysis of adhesive and swelling which are the goals of applicant's microwaving. In particular, fluids entering a solid wood medium go either into the wood cell walls or into the holes inside the cells (lumen). For "impregnation" as discussed in the prior art, the aim is to ensure that some of the fluid component penetrates and is retained in the cell walls. Various techniques are used to do this such as ensuring that fluid can flow freely throughout the wood structure (this could be done by keeping pits open or degrading pits), affecting the cell wall structure somehow so that it takes up more treatment fluid, etc .

Wood which has been dried out, and then takes on water, will initially swell only if the wood being treated is below about 28% moisture content. Wood which is already at about 28% moisture will not swell; that is, the cell lumens take on the water with no associated swelling. So swelling may or may not occur with the impregnation of fluids into wood as described in the prior art. And, in any event, the impregnation is what is sought to be achieved, not the incidental swelling which may or may not occur.

In contrast, MDF is very dry (7 to 10% moisture content) and the water causes welling because it is entering the wood cell walls. Moreover, the water or other fluid is breaking down the glue bonds, thus exaggerating the swell. But in wood impregnation, the swelling is purely associated with the uptake of water based fluids into the cell walls, and any swelling -- which may or may not occur -- has nothing to do with the breakdown or separation of fibres. That is the main difference between the prior art's "impregnation" and the "swelling" with respect to MDF as referred to in the claims.

With regard to Russell, it refers to wood chips, glass fibre, asbestos, rayon, wool, etc., none of which is medium density fibreboard. Russell also

relates to facilitating impregnation, which does not directly correlate to applicant's goals of hydrolysis of adhesive and swelling for the reasons stated above.

Applicant therefore respectfully submits that while one skilled in the art would not consider Akhtar to be relevant, one would deem it not to be helpful even if it were relevant. And neither JP005 nor Russell provide any reason for one to think such microwaving would be relevant or helpful to hydrolysing adhesive and facilitating swelling of medium density fibreboard.

With respect to claim 42, applicant further respectfully submits that even if there were a valid reason to make the claimed combination, the combination fails to suggest the further requirements of claim 42. In particular, claim 42 requires a microwave exposure time in the range of 30 to 90 seconds at 500 W to 30 KW.

Akhtar generally urges microwave treatment for 5, 6, and 8 minutes [0055, 0057, 0064, 0069, Table 5, claim 21, etc.], and only in Fig. 7 refers to a treatment time as low as 1.5 minutes. But this treatment was at 50 kW, 60% greater than the maximum level of claim 42. The Office asserts that applicant's 30 to 90 second exposure time would have been obvious since time is a result-effective variable. However, to the extent it is result-effective, it is effective to "lower refiner energy requirements" for further refining natural wood logs for paper pulping as stated by Akhtar at [0056]. It is not result-effective for any purpose germane to Michanickl's or applicant's process, and there is no basis for one skilled in the art to conclude that 30 to 90 seconds would be suitable for hydrolysing adhesive of MDF and facilitating swelling.

The other claims all depend directly or indirectly from claim 23 and are patentable for the same reasons as claim 23.

Applicant respectfully requests reconsideration of the rejection of claims as being unpatentable under 35 U.S.C. §103(a) over Michanickl in view of Dannenhauer.

Dannenhauer discloses a process involving comminuting (mechanically breaking, e.g., grinding) a fibre-containing composite material, placing it in a container with a solvent, and subjecting it to microwave radiation. The starting material contains aramid fibres, carbon fibres, glass fibres, or SiC fibres in an

epoxide or other thermoplastic or thermosetting plastic matrix. As stated at column 1, line 55 ff, the microwave energy causes the polymer chains of the plastic matrix to break, comminute, and dissolve in the solvent.

Dannenhauer's materials -- being carbon, glass, aramid, or SiC fibres in a plastic matrix -- do not resemble MDF or other board material at all. MDF is lignocellulosic fibres bonded together by an adhesive of e.g. polyurethane, urea/formaldehyde, melamine-urea or phenolic resin. Dannenhauer's "organic materials" are "thermoplastic and thermosetting plastic or synthetic resin such as, for example, epoxides, polyesters, polyamides and polyimides or mixtures thereof." Column 2, line 47 ff. These organic components bear no relation to the timber-derived board materials required by the MDF reference of applicant's claims. One skilled in the art seeing from Dannenhauer that microwaves assisted by solvent help dissolve "thermoplastic and thermosetting plastic or synthetic resin" of comminuted carbon-fibre reinforced material would have no reason to think incorporating microwave irradiation into Michanickl's process for MDF would be helpful. Recycling MDF does not involve any function or operation resembling dissolving "epoxides, polyesters, polyamides, and polyimides." Accordingly, since the processes and materials are so different, there is no basis to make the proposed combination. Claims 23 et al. are therefore respectfully submitted to be patentable over the proposed combination of Michanickl and Dannenhauer.

CONCLUSION

In view of the above, favorable reconsideration and allowance of all pending claims are respectfully requested.

Respectfully submitted,

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